State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

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To: DISTRICT LANDSCAPE ARCHITECTS **Date:** April 12, 2006

From: KEITH ROBINSON
Principal Landscape Architect
Landscape Architecture Program

Subject: Planting of Pines and Pitch Canker Risk

This memo supersedes current guidance on pitch canker disease and the planting of pine trees within the State Right-of-Way by the Department and others. Ten years has passed since the original guidance on this subject was issued. During that time additional research on pitch canker has occurred and the risk factors associated with the planting of pine trees have been more clearly identified. The University of California, Davis has assisted the Department with developing an updated rating system (see "Pitch Canker Risk Rating System" attached) that reflects the current view of the risk to pine trees due to pitch canker.

When selecting pine species for planting within the State Right-of-Way it is critical to understand that there are no curative treatments for this disease. The rating system is based on risk factors that consider species susceptibility and location. The combined value of these two factors determines the species infection risk. Coastal areas continue to be an ideal environment for establishment of the disease in most pine species. One notable result from the recent research is that Pinus canariensis (Canary Island Pine) and Pinus pinea (Italian Stone Pine) have been moved from a "high susceptibility" category to a "low susceptibility" category.

Pine species with a combined rating of 2 to 5 are considered to have a "very low" or "low" risk and may be planted on State Right-of-Way. Species with a combined rating of 6 or 7 are considered to have a "moderate" risk and their use requires approval of a design exception from the Landscape Architecture Program. The exception request (see attached form) must include concurrence from the District Landscape Specialist, and local controlling agency, e.g., Department of Forestry, County Agriculture Commissioner. Final approval by the Landscape Architecture Program will be granted only when the District can demonstrate that existing pines,

within the proposed locations or in the vicinity of new pines have shown no affects of pitch canker. Species with ratings of 8 or 9 are considered to have a “high” or “very high” risk and remain prohibited. The attached table, “Planting Guide for Pinus Species”, provides a summary of the current guidance. Planting of pine species not listed in the attached table requires the same approval process as an exception request.

If you have any questions, or need additional information please contact Jack Broadbent at (916) 654-3170 or Dennis Cadd at (916) 654-5370.

Attachments

PLANTING GUIDE FOR PINE SPECIES

PITCH CANKER RISK FACTORS		Species			
		1 • Pinus canariensis • P. pinea • P. thunbergiana • Pseudotsuga menziesii	**2** • Pinus coulteri • P. halepensis • P. lambertiana • P. monophylla • P. torreyana	**3** • Pinus contorta *subsp*. contorta • P. contorta *subsp*. murryana • P. jeffreyi • P. patula • P. ponderosa • P. sabiniana	**4** • Pinus attenuata • P. muricata • P. radiata
Location	**1** Sierra Nevada above 6000 feet, Modoc, Lassen, Siskiyou, Inyo, Mono, east Kern, Imperial, much of Riverside and San Bernardino Cos.	**2** (Very low risk)	**3** (Very low risk)	**4** (Very low risk)	**5** (Low risk)
	2 San Joaquin and Sacramento Valleys	**3** (Very low risk)	**4** (Very low risk)	**5** (Low risk)	**6** (Moderate risk)
	3 Sierra Nevada foothills below 6000 feet, and Del Norte, Humboldt, and Lake Cos.	**4** (Very low risk)	**5** (Low risk)	**6** (Moderate risk)	**7** (Moderate risk)
	4 Alameda, Contra Costa, Napa, Marin, Mendocino, Orange, San Benito, Santa Clara, San Diego, Solano, Ventura, and Los Angeles Cos.	**5** (Low risk)	**6** (Moderate risk)	**7** (Moderate risk)	**8** (High risk)
	5 Monterey, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, and Sonoma Cos.	**6** (Moderate risk)	**7** (Moderate risk)	**8** (High risk)	**9** (Very high risk)

Combined risk of 2 to 5 is “very low” or “low” and planting on the right-of-way is allowed.
Combined risk of 6 or 7 is “moderate” and requires design exception from the Land. Arch. Program (and when planting pine species not listed above).
Combined risk of 8 or 9 is “high” or “very high” and planting on the right-of-way is not allowed

GENERAL INSTRUCTIONS – EXCEPTIONS TO PINE PLANTING POLICY

This form is to be used for all exceptions to the Pine Planting Policy. An exception is required when the Department or others propose to plant pine species within the State Right-of-Way that have a “moderate” infection risk to pitch canker. The risk factors are determined by considering species susceptibility and location as provided in the “Planting Guide for Pine Species”. Exception requests are also required when it is proposed to plant pine species not listed in this guide. This approval is to be obtained as soon as the plant list is identified.

Dist-Co-Rte-PM
Source Unit-EA

Fact Sheet
Exception to Pine Planting Policy

Submitted by	_____	_____
	District Landscape Architect	Date
Concurred by	_____	_____
	District Landscape Specialist Maintenance	Date
Approved by	_____	_____
	District Coordinator Landscape Architecture Program	Date

Dist-Co-Rte-PM
Source Unit-EA

1. PROPOSED PROJECT

A. Project Description:
Briefly describe the project; what is the roadside proposal? Note the type of project and/or major elements of work to be done, such as new planting, full replacement planting, mitigation planting, etc.

B. Existing Conditions:
How will this project impact existing conditions? Briefly describe the existing roadside conditions. What is the condition of the existing pines within the proposed location(s) or in the vicinity of new pines? Is there any evidence of pitch canker disease?

2. REASON FOR REQUESTING AN EXCEPTION

Briefly describe the reasons why use of the proposed pine species is necessary for this project, and why another pine species with a lower risk to pitch canker cannot be used.

3. PROJECT REVIEWS, CONCURRENCE

Note project reviews by District Landscape Specialist. Provide a discussion of any issues identified by Maintenance.

4. ATTACHMENTS

Provide additional concurrence documentation from the local controlling agency, e.g., Department of Forestry, County Agriculture Commissioner, that supports the use of the proposed pine species.

Pitch Canker Risk Rating System

Dr. Thomas R. Gordon
Brenna Aegerter
April 11, 2006

Introduction

Pitch canker, caused by *Fusarium circinatum*, is an important problem affecting pines in both urban and native forests. There are no curative treatments for individual trees damaged by pitch canker, so management relies primarily on avoidance. Thus, selection of a landscape tree should be informed by some consideration of the risk posed by pitch canker. This publication provides a means of evaluating the magnitude of that risk, based on planting location and the pine species of interest. Where trees have been removed due to damage from pitch canker, these ratings may offer some guidance in the selection of a replacement species. Where pitch canker is not yet present, risk ratings will provide a rough indication of the potential for this disease to be a problem in the future.

For more information about pitch canker in California, see the UC ANR publications 21616 (Pitch Canker: A Technical Review) and 74107 (Pest Note) and visit the Pitch Canker Task Force Web site at: http://frap.cdf.ca.gov/pitch_canker/

The Host Factor

The number assigned to each species (Table 1) is based on inherent susceptibility of the species and the occurrence of naturally infected trees in California (as of February 2005). Susceptibility is gauged by inoculating healthy trees in the greenhouse. This is accomplished by introducing spores of the fungus into a small wound made on a stem. After a number of weeks, the bark is pared back and the length of the lesion (i.e., diseased tissue) is measured. Relative susceptibility is determined by the extent of pathogen growth, which is revealed as discolored tissue. Susceptibility as determined by this method has been shown to be a good indicator of how much damage a species will suffer in the landscape.

Species with a risk value of four are highly susceptible in greenhouse tests and diseased trees are commonly observed in some areas. Species in group three are susceptible in greenhouse tests but have not been seen to sustain significant damage in the California landscape. Species in group two exhibit moderate susceptibility in greenhouse tests. Species in group one are relatively resistant, and most individuals should not sustain any damage from the disease.

Pine species not listed here either have not been adequately tested for susceptibility to pitch canker, or are not commonly grown in California. Preliminary tests suggest some non-listed species may be moderately

susceptible (e.g., eldarica pine), while others may be resistant (brutia pine). In the absence of evidence to the contrary, all pine species should be assumed to have some risk of damage due to pitch canker. However, it should be borne in mind that most alternative landscape trees will also be at risk of damage from one or more other insects or diseases.

The Location Factor

The risk values assigned to various locations are shown in Table 2. These values are based in part on the climatic regime, but also on the known distribution of pitch canker. At present, the disease is most abundant in coastal California. This may reflect a geographical limitation on the disease, and/or the fact that this is where the disease was first established in California. Based on temperature requirements for pathogen growth and geographic ranges of insect vectors, there is no apparent reason why the disease should not occur where susceptible trees are found in more inland locations. However, some evidence indicates that atmospheric moisture, in the form of fog or high relative humidity, may be required for the pitch canker pathogen to establish infections. If so, drier weather away from the coast may limit opportunities for infection. Also, the availability of moisture must coincide with periods of moderate temperatures. Thus typical weather patterns in the Sierra foothills would provide permissive conditions during the spring and fall in most years; whereas the summer would likely be too dry and the winter too cold. The narrower seasonal window for activity of the pathogen should make it more difficult for the disease to become established and limit its potential for development, relative to coastal areas where the environment is suitable throughout most of the year. At higher elevations, cooler temperatures would further limit the duration of suitable conditions. Likewise, drier weather east of the Sierra Nevada, in the southern San Joaquin Valley, and in the desert implies a very low risk of damage from pitch canker in these areas.

Calculating Risk

An estimate of the risk of pitch canker can be obtained by adding together the host and location factors. By this method, the following categories are applicable:

Sum of Host and Location Factors	Overall Risk
9	**Very High**
8	**High**
6-7	**Moderate**
5	**Low**
2-4	**Very Low**

Where a species/location combination is in the “Very high” risk category, damage from pitch canker is likely and may be severe enough to require removal of the diseased tree. Note that even within susceptible species, individuals may show some level of resistance, so the extent of damage from pitch canker cannot be predicted with certainty. In the “High” risk category, the likelihood of infection is somewhat lower and the disease may be less severe on trees that do become infected. Where the risk is categorized as “Moderate”, trees may escape infection entirely and severe disease is unlikely. If the risk falls into the “Low” or “Very Low” category, the occurrence of pitch canker may be considered unlikely, or very unlikely, respectively.

Table 1. Risk values assigned to known host species.

4: HIGH SUSCEPTIBILTY

Pinus attenuata (Knobcone Pine)
P. muricata (Bishop Pine)
P. radiata (Monterey Pine)

3: POTENTIALLY HIGH SUSCEPTIBILITY

Pinus contorta subsp. contorta (Shore Pine)
P. contorta subsp. murryana (Lodgepole Pine)
P. jeffreyi (Jeffrey Pine)
P. patula (Mexican Weeping Pine)
P. ponderosa (Ponderosa Pine)
P. sabiniana (Gray Pine)

2: MODERATE SUSCEPTIBILITY

Pinus coulteri (Coulter Pine)
P. halepensis (Aleppo Pine)
P. lambertiana (Sugar Pine)
P. monophylla (Pinyon Pine)
P. torreyana (Torrey Pine)

1: LOW SUSCEPTIBILITY

Pinus canariensis (Canary Island Pine)
P. pinea (Italian Stone Pine)
P. thunbergiana (Japanese Black Pine)
Pseudotsuga menziesii (Douglas Fir)

Table 2. Risk values assigned to various locations in California[1].

5: Pitch canker is prevalent in at least some parts of the following counties:

- Monterey Co.
- San Francisco Co.
- San Luis Obispo Co.
- San Mateo Co.
- Santa Barbara Co.
- Santa Cruz Co.
- Sonoma Co.

4: Some pitch canker infected trees have been observed and the climate in at least some parts of these counties should be conducive to more extensive development:

- Alameda Co.
- Contra Costa Co.
- Napa Co.
- Marin Co.
- Mendocino Co.
- Orange Co.
- San Benito Co.
- Santa Clara Co.
- San Diego Co.
- Solano Co.
- Ventura Co.
- Los Angeles Co.

3: Pitch canker has not been reported but climate is conducive in some part of each of these areas during part of the year:

- Del Norte Co.
- Humboldt Co.
- Lake Co.
- Sierra Nevada foothills below 6000 feet[2]

2: Climate makes the occurrence of pitch canker unlikely:

- The San Joaquin and Sacramento Valleys

1: Climate and/or distance from presently infected sites make the occurrence of pitch canker very unlikely:

- Sierra Nevada above 6000 feet
- Northeastern California (Modoc, Lassen, Siskiyou Cos.)
- East of the main axis of the Sierra Nevada (Inyo, Mono Cos.)
- Southern California desert areas (Imperial Co., much of Riverside and San Bernardino Cos.)

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[1]Most counties are divided between areas differing in risk. Consult the map (Fig.1) to identify the appropriate risk value within a county.

[2]The pitch canker pathogen was identified in El Dorado County in January of 2004, but no trees in this area are known to be infected at this time (July, 2005). For information on the current status of this infestation, contact the Agricultural Commissioner's office in El Dorado County, or the U.S. Forest Service.